CHAPTER 2

DESCRIPTION OF THE LOWER FRENCH BROAD RIVER WATERSHED

2.1. BACKGROUND. The French Broad River is 210 miles long, rising in the Blue Ridge Mountains in western North Carolina. The river flows north and northwest to Knoxville, where it joins with the Holston River to form the Tennessee River. The river was an important settlers' route from the southeast coastal states into Tennessee during the colonial period and was named for being one of two broad rivers in western North Carolina and Eastern Tennessee. The one which flowed into formerly French territory was named the French Broad, and the other which stayed in English territory (the American colonies) was named the English Broad, now just the Broad River. On the river is Douglas Dam, part of the Tennessee Valley Authority (TVA), forming Douglas Lake, which is used for flood control.

This Chapter describes the location and characteristics of the Lower French Broad River Watershed.

2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The Lower French Broad River Watershed is located in East Tennessee and includes parts of Blount, Cocke, Jefferson, Knox, and Sevier Counties.

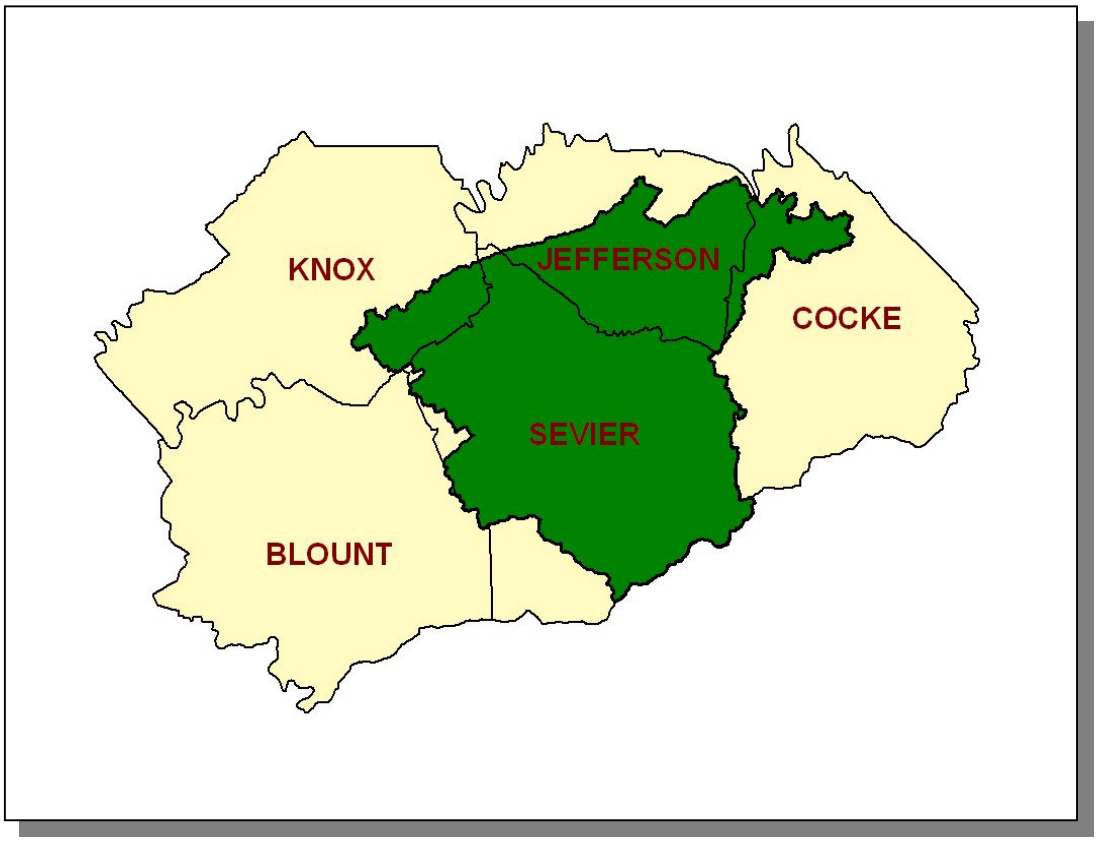

Figure 2-1. General Location of the Lower French Broad River Watershed.

COUNTY	% OF WATERSHED IN EACH COUNTY
Sevier	65.54
Jefferson	22.96
Knox	6.55
Cocke	5.86
Blount	0.08

Table 2-1. The Lower French Broad River Watershed Includes Parts of Five East Tennessee Counties.

2.2.B. Population Density Centers. One interstate and fifteen highways serve the major communities in the Lower French Broad River Watershed.

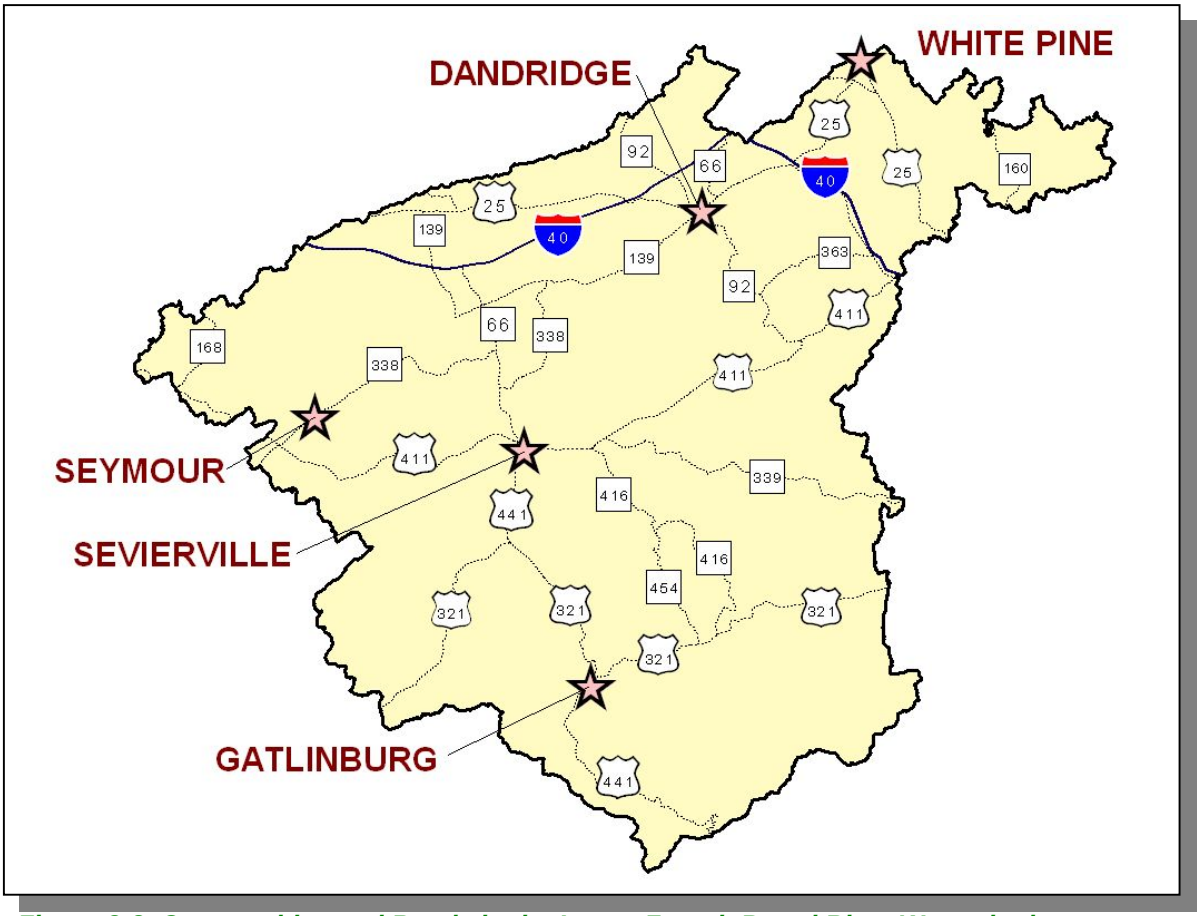

Figure 2-2. Communities and Roads in the Lower French Broad River Watershed.

MUNICIPALITY	POPULATION	COUNTY
Sevierville*	12,434	Sevier
Seymour	8,850	Sevier
Gatlinburg	3,382	Sevier
Dandridge*	2,078	Jefferson
White Pine	1,997	Jefferson

Table 2-2. Municipalities in the Lower French Broad River Watershed. *Population based on 2000 census (Tennessee Blue Book) or http://www.hometownlocator.com. Asterisk (*) indicates county seat.*

2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Lower French Broad River Watershed, designated 06010107 by the USGS, is approximately 796 square miles and drains to the French Broad River.

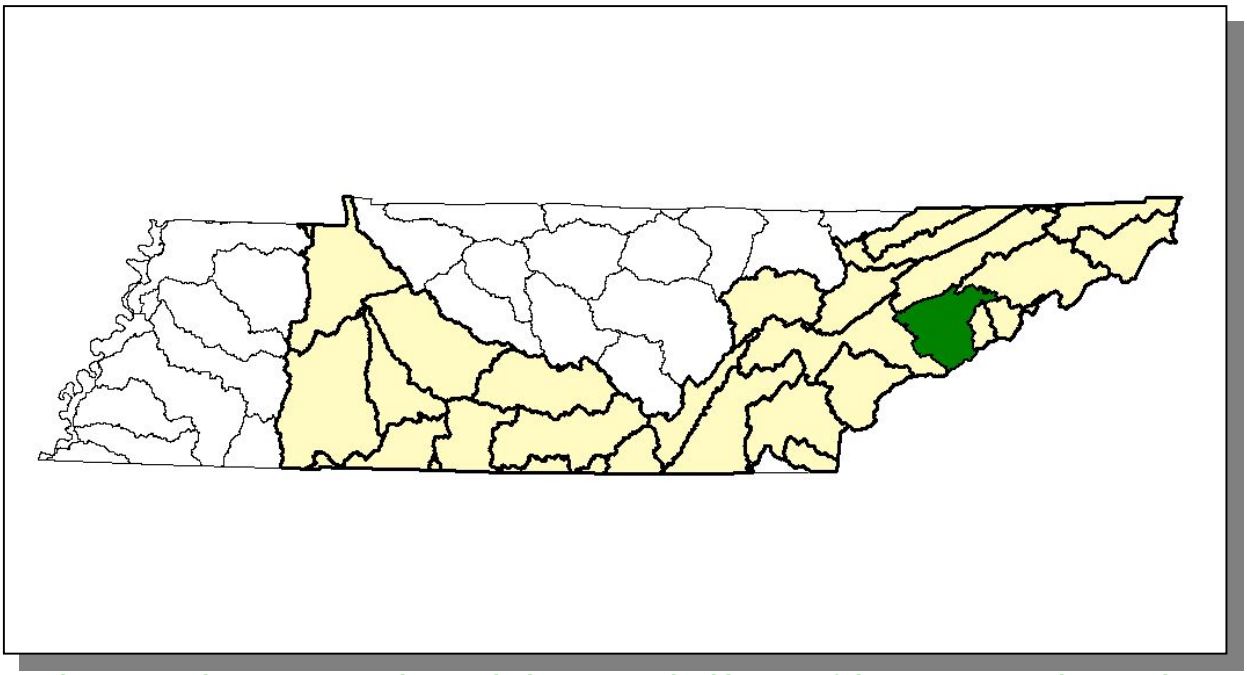

Figure 2-3. The Lower French Broad River Watershed is Part of the Tennessee River Basin.

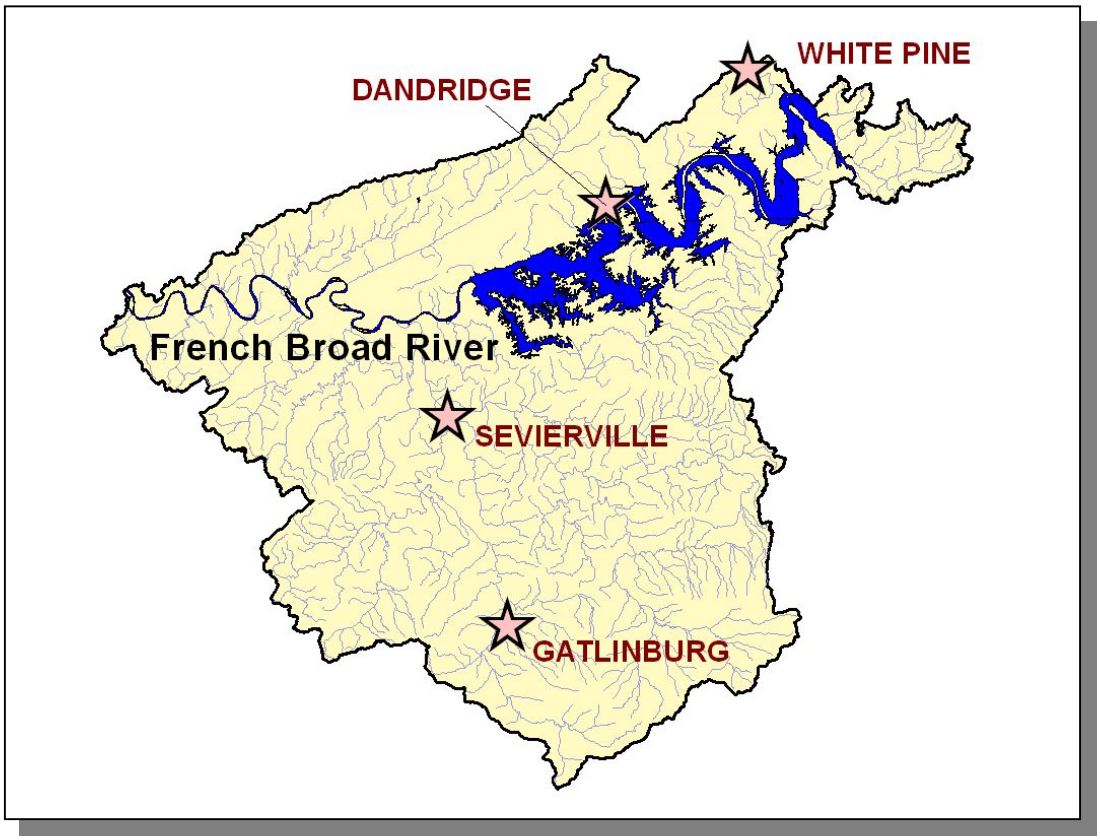

Figure 2-4. Hydrology in the Lower French Broad River Watershed. *There are 1,205.6 stream miles and 30,400 lake acres recorded in River Reach File 3 in the Lower French Broad River Watershed. Location of the French Broad River including Douglas Lake, and the cities of Dandridge, Gatlinburg, Sevierville, and White Pine are shown for reference.*

2.3.B. Dams. There are 10 dams inventoried by TDEC Division of Water Supply in the Lower French Broad River Watershed. These dams either retain 30 acre-feet of water or have structures at least 20 feet high.

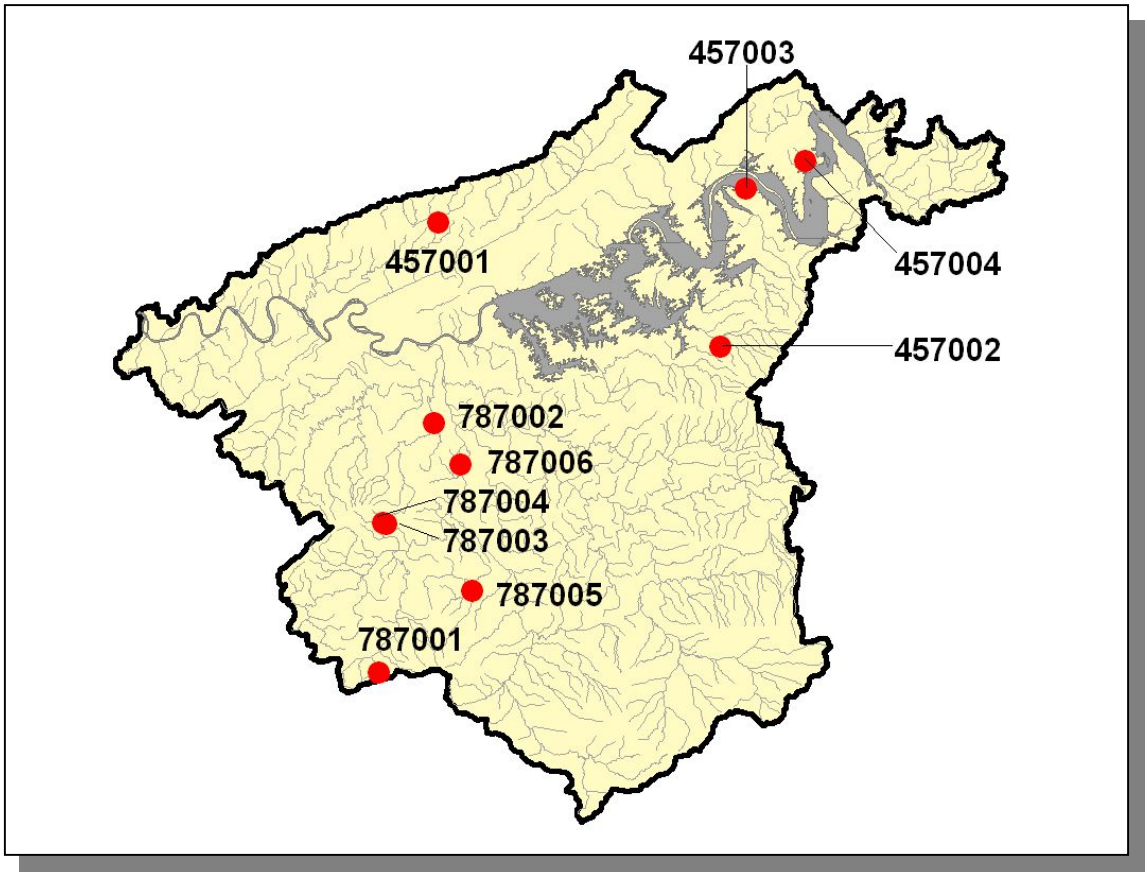

Figure 2-5. Location of Inventoried Dams in the Lower French Broad River Watershed. *More information, including identification of inventoried dams labeled, is provided in Appendix II and at http://gwidc.memphis.edu/website/dams/viewer.htm.*

2.4. LAND USE. Land Use/Land Cover information was provided by EPA Region 4 and was interpreted from 2001 Multi-Resolution Land Cover (MRLC) satellite imagery.

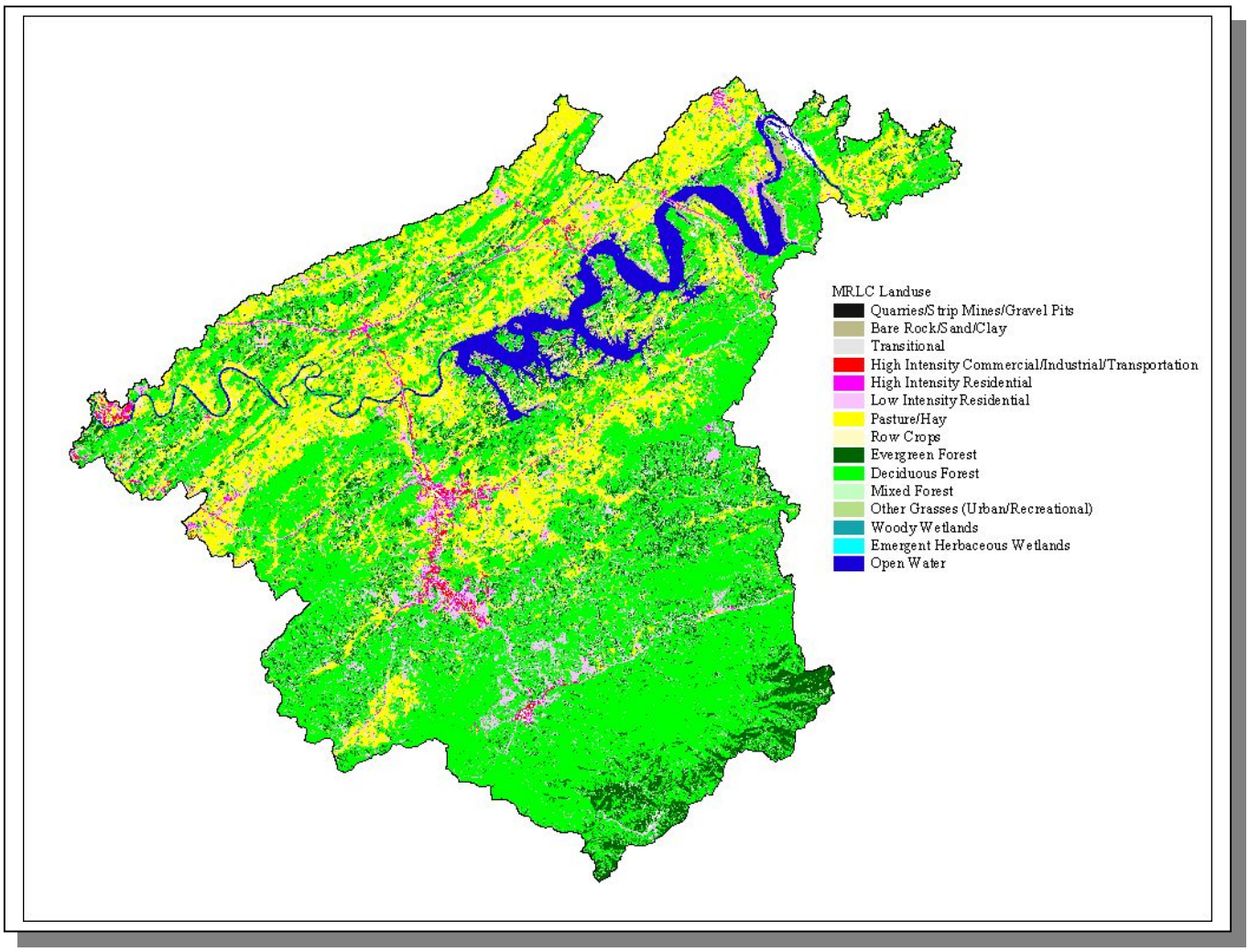

Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery.

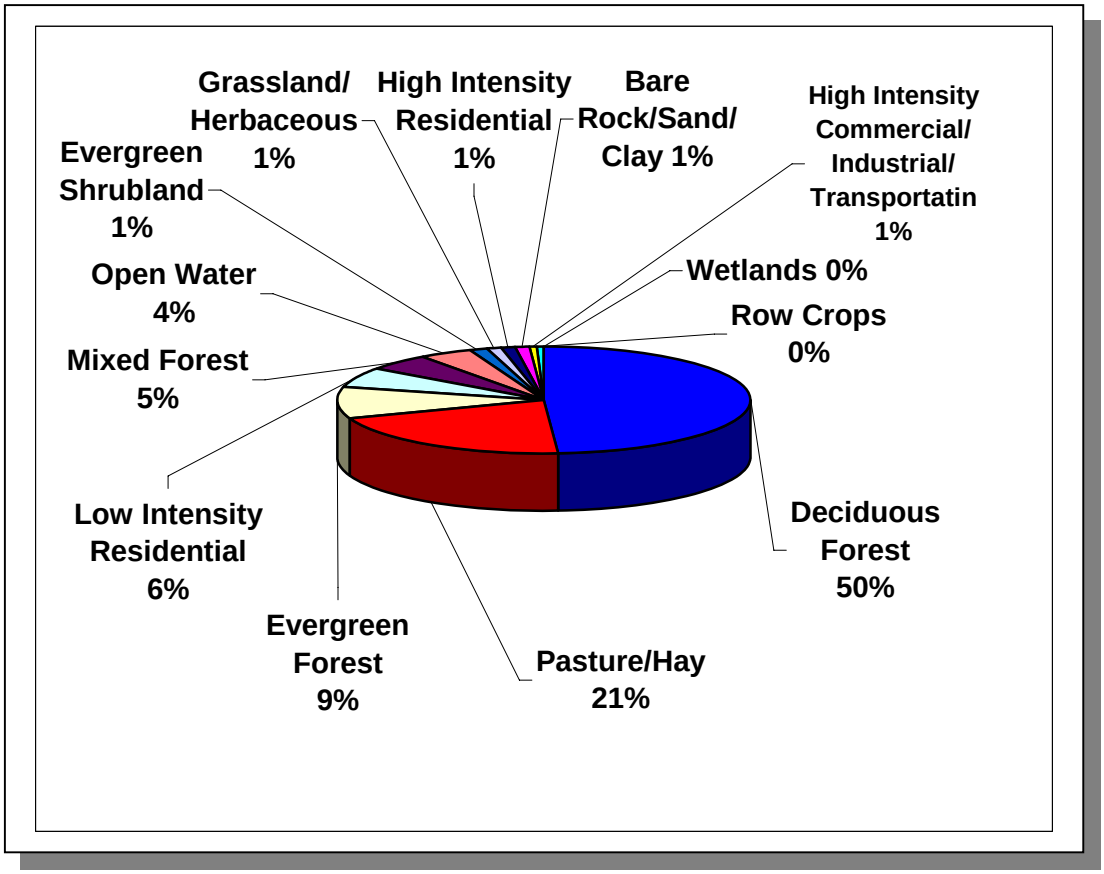

Figure 2-7. Land Use Distribution in the Lower French Broad River Watershed. *More information is provided in Appendix II.*

Sinkholes, springs, disappearing streams and caves characterize karst topography. The term "karst" describes a distinctive landform that indicates dissolution of underlying soluble rocks by surface water or ground water. Although commonly associated with limestone and dolomite (carbonate rocks), other highly soluble rocks such as gypsum and rock salt can be sculpted into karst terrain. In karst areas, the ground water flows through solution-enlarged channels, bedding planes and microfractures within the rock. The characteristic landforms of karst regions are: closed depressions of various size and arrangement; disrupted surface drainage; and caves and underground drainage systems. The term "karst" is named after a famous region in the former country of Yugoslavia.

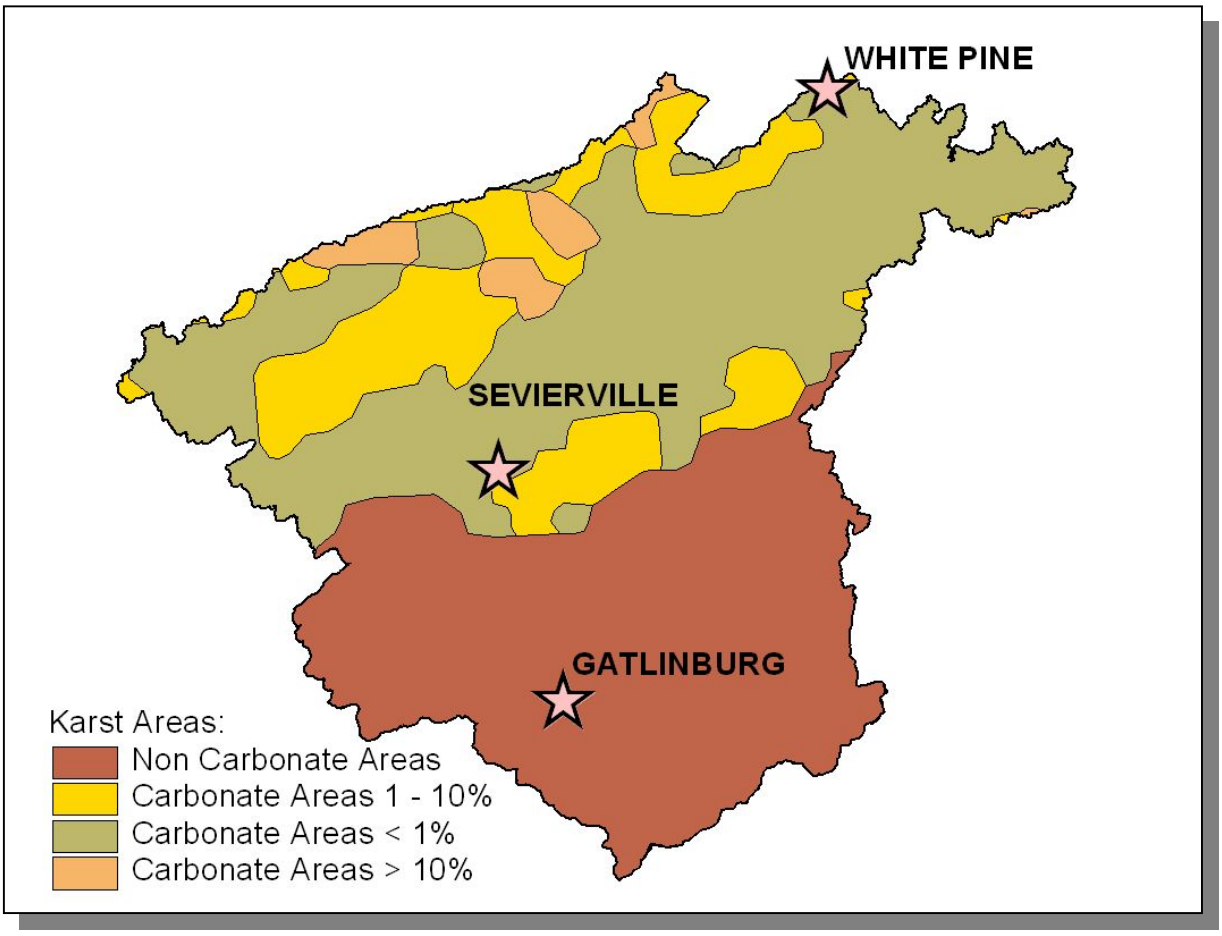

Figure 2-8. Illustration of Karst Areas in Lower French Broad River Watershed. *Locations of communities in the watershed are shown for reference.*

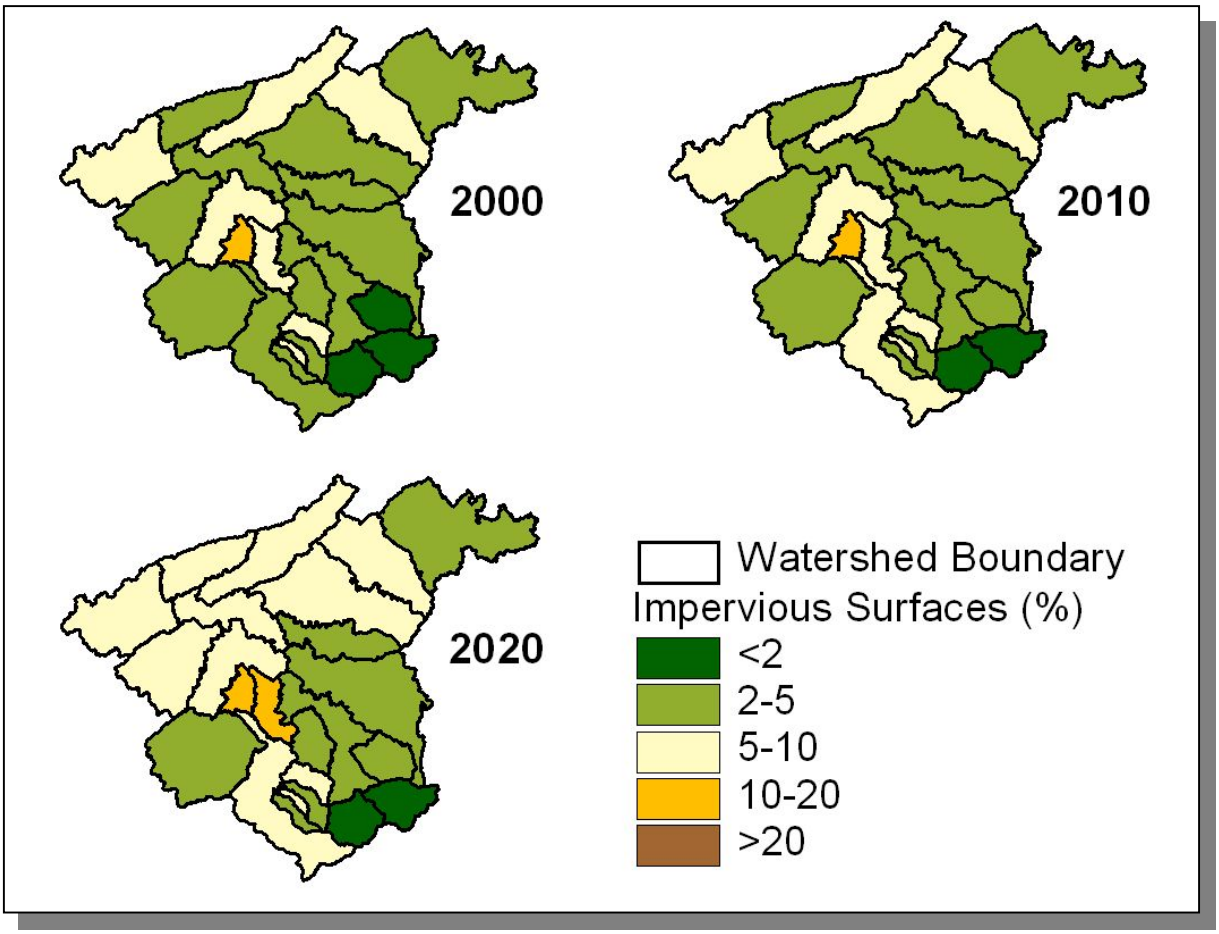

Figure 2-9. Illustration of Total Impervious Area in the Lower French Broad River Watershed. *All HUC-12 subwatersheds are shown. Current and projected total impervious cover is provided by EPA Region 4. More information can be found at: http://www.epa.gov/ATHENS/research/impervious/*

2.5. ECOREGIONS AND REFERENCE STREAMS. Ecoregions are relatively homogeneous areas of similar geography, topography, climate and soils that support similar plant and animal life. Ecoregions serve as a spatial framework for the assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregion studies can aid the selection of regional stream reference sites, identifying high quality waters, and developing ecoregion-specific chemical and biological water quality criteria.

There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee. The Lower French Broad Watershed lies within 2 Level III ecoregions (Blue Ridge Mountains and Ridge and Valley) and contains 7 Level IV subecoregions:

- **Southern Sedimentary Ridges (66e)** include some of the westernmost foothill areas of the Blue Ridge Mountains ecoregion, such as the Bean, Starr, Chilhowee, English, Stone, Bald, and Iron Mountain areas. Slopes are steep, and elevations are generally 1000-4500 feet. The rocks are primarily Cambrian-age sedimentary (shale, sandstone, siltstone, quartzite, conglomerate), although some lower stream reaches occur on limestone. Soils are predominantly friable loams and fine sandy loams with variable amounts of sandstone rock fragments, and support mostly mixed oak and oak-pine forests.

- **Limestone Valleys and Coves (66f)** are small but distinct lowland areas of the Blue Ridge, with elevations mostly between 1500 and 2500 feet. About 450 million years ago, older Blue Ridge rocks to the east were forced up and over younger rocks to the west. In places, the Precambrian rocks have eroded through to Cambrian or Ordovician-age limestones, as seen especially in isolated, deep cove areas that are surrounded by steep mountains. The main areas of limestone include the Mountain City lowland area and Shady Valley in the north; and Wear Cove, Tuckaleechee Cove, and Cades Cove of the Great Smoky Mountains in the south. Hay and pasture, with some tobacco patches on small farms, are typical land uses.

- **Southern Metasedimentary Mountains (66g)** are steep, dissected, biologically-diverse mountains that include Clingmans Dome (6643 feet), the highest point in Tennessee. The Precambrian-age metamorphic and sedimentary geologic materials are generally older and more metamorphosed than the Southern Sedimentary Ridges (66e) to the west and north. The Appalachian oak forests and, at higher elevation, the northern hardwoods include a variety of oaks and pines, as well as silverbell, hemlock, yellow poplar, basswood, buckeye, yellow birch, and beech. The native spruce-fir forest, found generally above 5500 feet, has been affected greatly over the past twenty-five years by the great woolly aphid. The Copper Basin, in the southeast corner of Tennessee, was the site of copper mining and smelting from the 1850's to 1987, and once left more than fifty square miles of eroded bare earth.

- **Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f)** form a heterogeneous region composed predominantly of limestone and cherty dolomite. Landforms are mostly low rolling ridges and valleys, and the soils vary in their productivity. Landcover includes intensive agriculture, urban and industrial, or areas of thick forest. White oak forests, bottomland oak forest, and sycamore-ash-elm riparian forest are the common forest types, and grassland barrens intermixed with cedar-pine glades also occur here.

- **Southern Shale Valleys (67g)** consist of lowlands, rolling valleys, and slopes and hilly areas that are dominated by shale materials. The northern areas are associated with Ordovician-age calcareous shale, and the well-drained soils are often slightly acid to neutral. In the south, the shale valleys are associated with Cambrian-age shales that contain some narrow bands of limestone, but the soils tend to be strongly acid. Small farms and rural residences subdivide the land. The steeper slopes are used for pasture or have reverted to brush and forested land, while small fields of hay, corn, tobacco, and garden crops are grown on the foot slopes and bottom land.

- **Southern Sandstone Ridges (67h)** encompass the major sandstone ridges with areas of shale and siltstone. The steep, forested ridges have narrow crests with soils that are typically stony, sandy, and of low fertility. The chemistry of streams flowing down the ridges can vary greatly depending on the geological material. The higher elevation ridges are in the north, including Wallen Ridge and Powell, Clinch and Bays Mountains. White Oak Mountain in the south has some sandstone on the west side, with abundant shale and limestone. Grindstone Mountain, capped by the Gizzard Group sandstone, is the only remnant of Pennsylvanian-age strata in the Ridge and Valley of Tennessee.

- The **Southern Dissected Ridges and Knobs (67i)** contain more crenulated, broken, or hummocky ridges, compared to the smoother, more sharply pointed sandstone ridges of Ecoregion 67h. Although shale is common, there is a mixture and interbedding of geologic materials. The ridges on the east side of Tennessee's Ridge and Valley tend to be associated with the Ordovician-age Sevier shale, Athens shale, and Holston and Lenoir limestones. These can include calcareous shale, limestone, siltstone, sandstone, and conglomerate. In the central and western part of Ecoregion 67, the shale ridges are associated with the Cambrian-age Rome Formation: shale and siltstone with beds of sandstone. Chestnut oak forests and pine forests are typical for the higher elevations of the ridges, with areas of white oak, mixed mesophytic forest, and tulip poplar on the lower slopes, knobs, and draws.

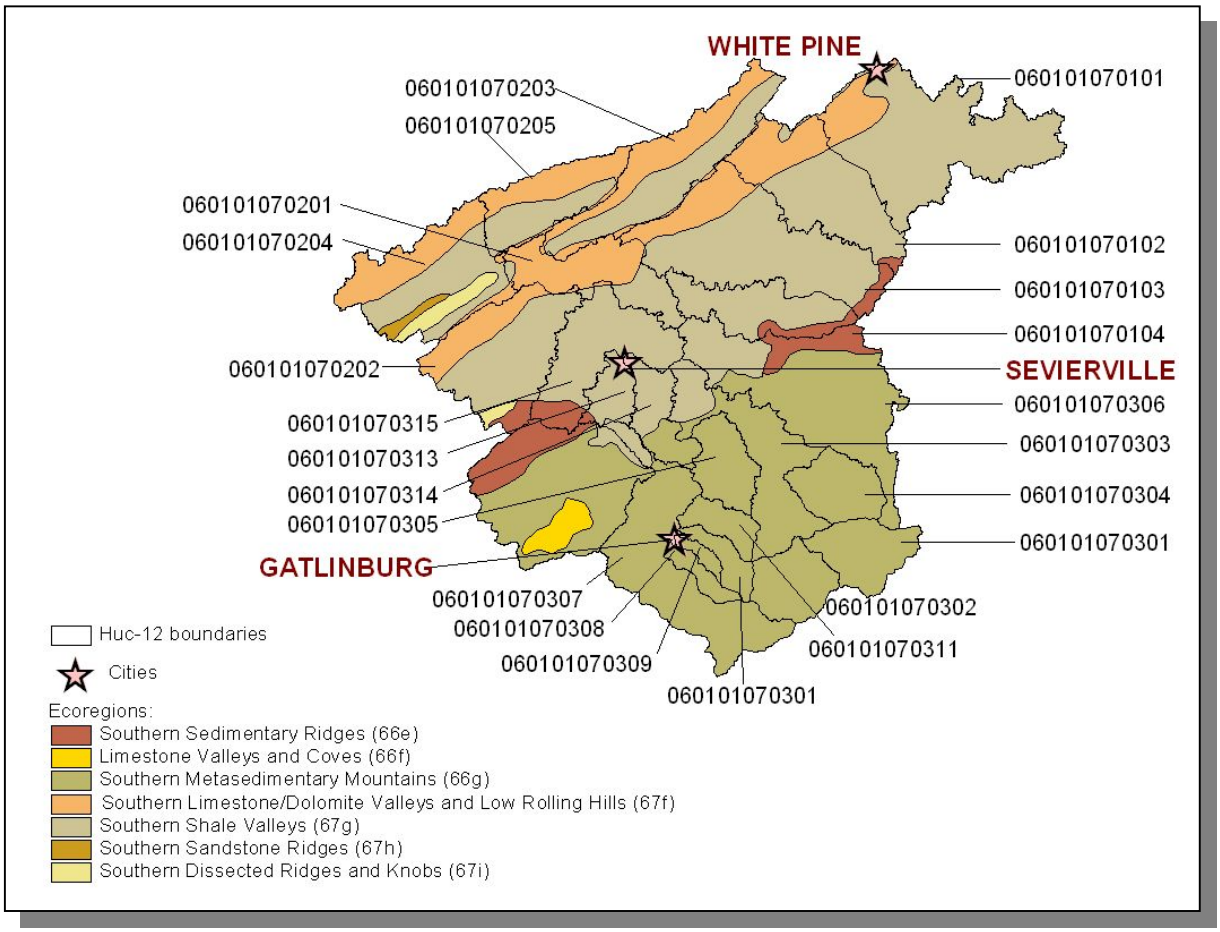

Figure 2-10. Level IV Ecoregions in the Lower French Broad River Watershed. *HUC-12 subwatershed boundaries and locations of Gatlinburg, Sevierville, and White Pine are shown for reference.*

Each Level IV Ecoregion has at least one reference stream associated with it. A reference stream represents a least impacted condition and may not be representative of a pristine condition.

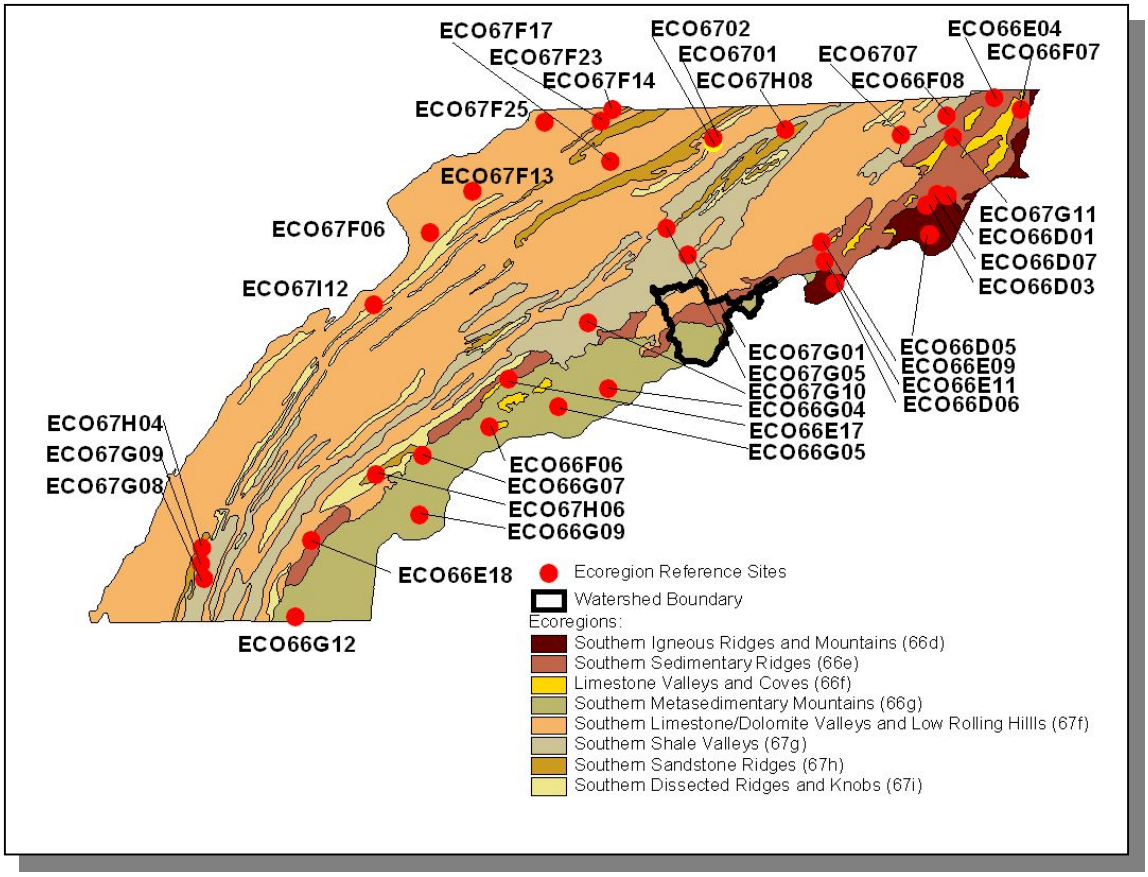

Figure 2-11. Ecoregion Monitoring Sites in Level IV Ecoregions 66d, 66e, 66f, 66g, 67f, 67g, 67h, and 67i. *The Lower French Broad River Watershed is shown for reference. More information, including which ecoregion reference sites were inactive or dropped prior to 01/01/2006, is provided in Appendix II.*

2.6. NATURAL RESOURCES.

2.6.A. Designated State Natural Area. The Natural Areas Program was established in 1971 with the passage of the Natural Areas Preservation Act. TDEC/Division of Natural Areas administers the State Natural Areas program. Further information may be found at http://www.state.tn.us/environment/na/.

The Lower French Broad River Watershed has one Designated State Natural Area:

> **Roundtop Mountain** is a 237-acre natural area located in the southwest corner of Sevier County west of Wears Cove Gap and east-northeast of Townsend. It forms a section of the northwest boundary of the Great Smoky Mountain National Park (GSMNP). When it was originally acquired, Roundtop Mountain was contiguous with approximately 1 mile of GSMNP boundary. It was acquired by the State in 1975 to protect this area of the Unaka Mountain range as a state natural area. At the time of its acquisition, and even today, this area remains highly susceptible to development, particularly from summer homes and vacation rentals. While the State initially planned to manage this area, it was soon determined that Roundtop Mountain could best be managed by the National Park Service as a part of the GSMNP.

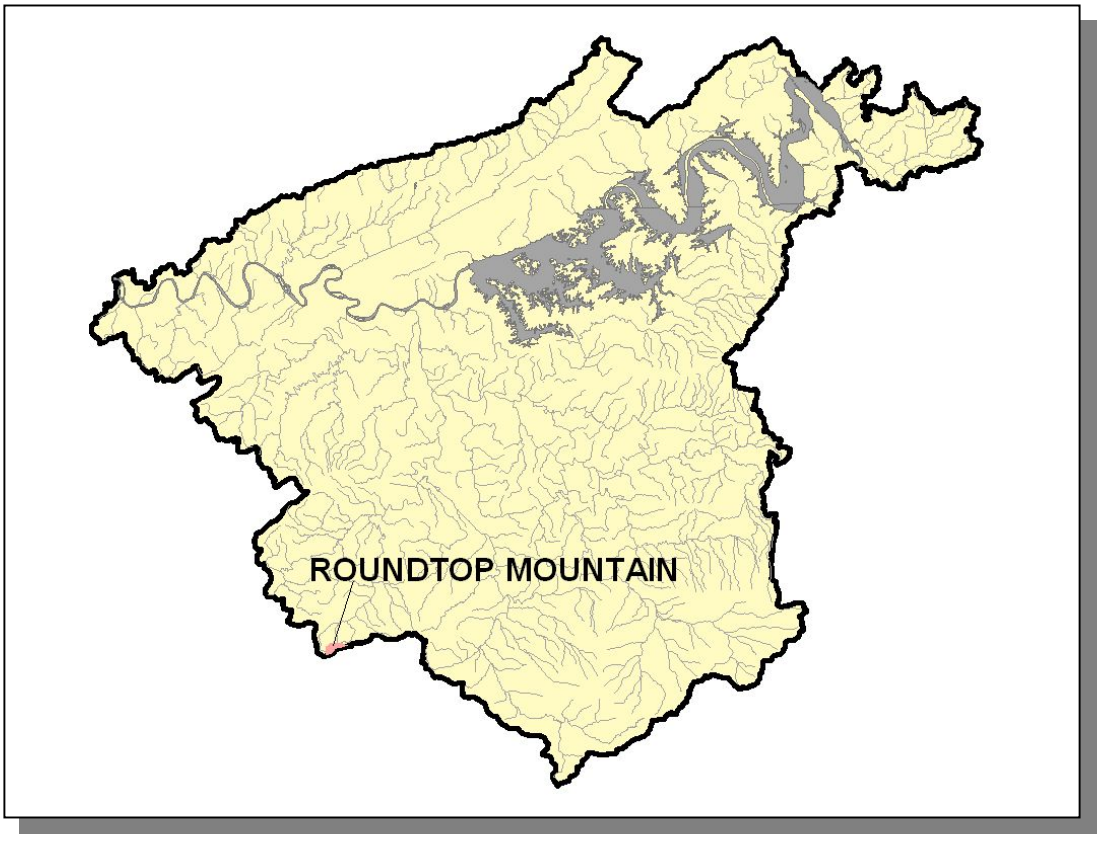

Figure 2-12. There is One Designated State Natural Area in the Lower French Broad River Watershed.

2.6.B. Rare Plants and Animals. The Heritage Program in the TDEC Division of Natural Areas maintains a database of rare species that is shared by partners at The Nature Conservancy, Tennessee Wildlife Resources Agency, the US Fish and Wildlife Service, and the Tennessee Valley Authority. The information is used to: 1) track the occurrence of rare species in order to accomplish the goals of site conservation planning and protection of biological diversity, 2) identify the need for, and status of, recovery plans, and 3) conduct environmental reviews in compliance with the federal Endangered Species Act.

GROUPING	NUMBER OF RARE SPECIES
Crustaceans	1
Insects	1
Mussels	10
Snails	1
Other	1
Amphibians	3
Birds	8
Fish	9
Mammals	15
Reptiles	1
Plants	81
Total	**131**

Table 2-3. There are 128 Known Rare Plant and Animal Species in the Lower French Broad River Watershed.

In the Lower French Broad River Watershed, there are nine known rare fish species, three rare amphibian species, one known rare crustacean species, ten rare mussel species, and one known rare snail species.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Acipenser fulvensis	Lake sturgeon		E
Etheostoma luteovinctum	Redband Darter		D
Etheostoma microlepidum	Finescale Darter		D
Cycleptus elongates	Blue sucker		T
Carpiodes velifer	Highfin Carpsucker		D
Percina aurantiaca	Tangerine Darter		D
Percina macrocephala	Longhead Darter		T
Percina tanasi	Snail Darter	LT	T
Phoxinus tennesseensis	Tennessee Dace		D
Desmognathus wrighti	Pigmy Salamander		D
Cryptobranchus alleganiensis	Hellbender		D
Eurycea junaluska	Junaluska Salamander		D
Orconectes shoupi	Nashville Crayfish	LE	E
Epioblasma brevidens	Cumberlandian Combshell	LE	E
Obovaria retusa	Ring Pink	LE	E
Plethobasus cooperianus	Orange-foot Pimpleback	LE	E
Plethobasus cyphyus	Sheepnose		C
Pleurobema plenum	Rough Pigtoe	LE	E
Quadrula cylindrica cylindrica	Rabbitsfoot		
Lampsilis abrupta	Pink Mucket	LE	E
Cyprogenia irrorata	Eastern Fanshell Pearly Mussel	LE	E
pioblasma capsaeformis	Oyster Mussel	LE	E
Dromus dromas	Dromedary Pearlymussel	LE	E
Lo fluvialis	Spiny Riversnail		

Table 2-4. Rare Aquatic Species in the Lower French Broad Watershed. *Federal Status: LE, Listed Endangered by the U.S. Fish and Wildlife Service; LT, Listed Threatened by the Tennessee Wildlife Resources Agency. State Status: T, Listed Threatened by the Tennessee Wildlife Resources Agency; E, Listed Endangered by the Tennessee Wildlife Resources Agency; D, Deemed in Need of Management by the Tennessee Wildlife Resources Agency. More information may be found at http://www.state.tn.us/environment/na/.*

2.6.C. Wetlands. The Division of Natural Areas maintains a database of wetland records in Tennessee. These records are a compilation of field data from wetland sites inventoried by various state and federal agencies. Maintaining this database is part of Tennessee's Wetland Strategy, which is described at:

http://www.state.tn.us/environment/na/wetlands/

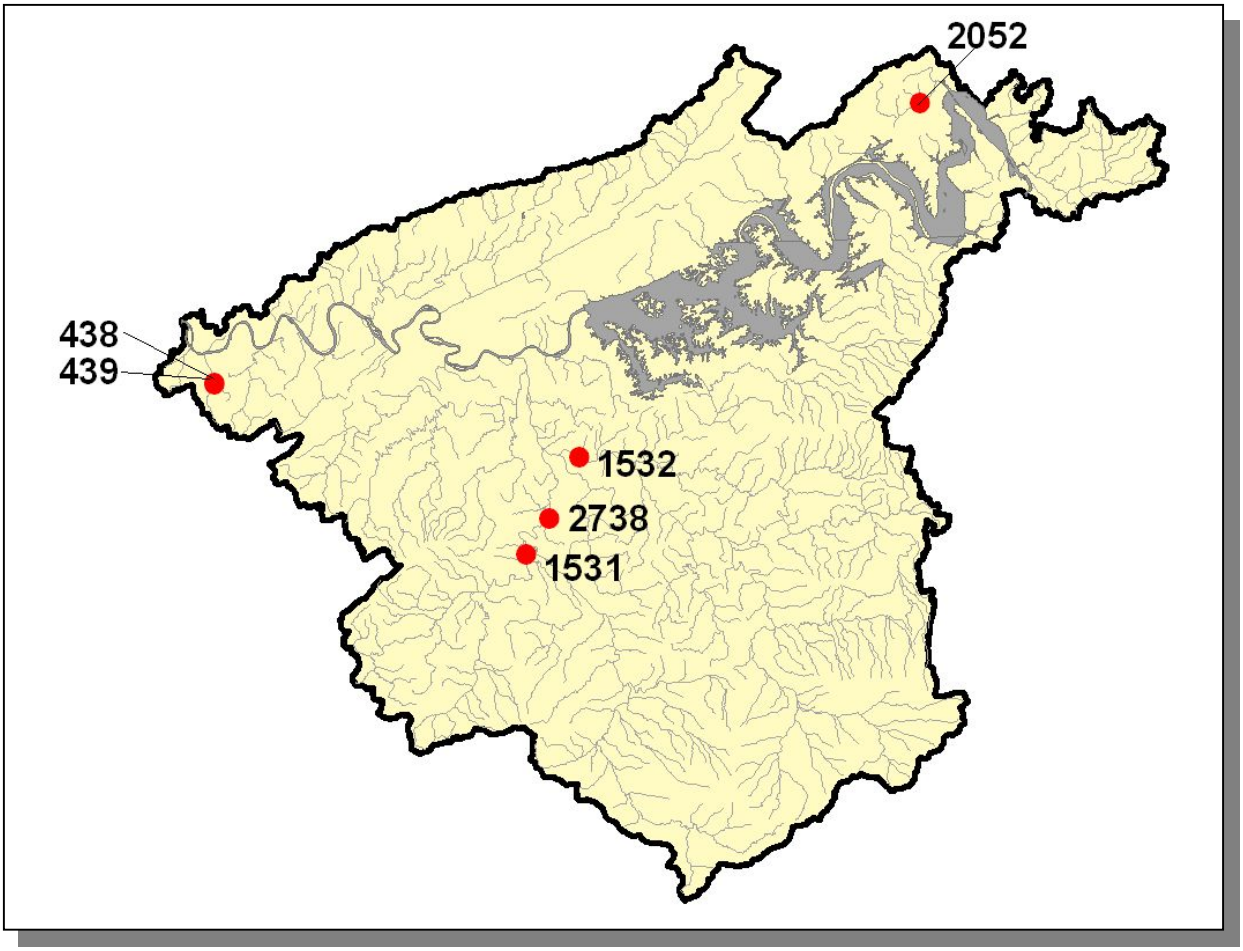

Figure 2-13. Location of Wetland Sites in TDEC Division of Natural Areas Database in Lower French Broad River Watershed. ***This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands.*** *There may be additional wetland sites in the watershed. More information, including identification of wetland sites labeled, is provided in Appendix II.*

2.7. CULTURAL RESOURCES.

2.7.A. State Scenic River. Tuckahoe Creek and portions of the French Broad River are designated as State Scenic Rivers.

Tuckahoe Creek is designated as a Class III Developed River Area.

French Broad River is designated as a Class III Developed River Area (That segment from the North Carolina state line to its confluence with Douglas Lake).

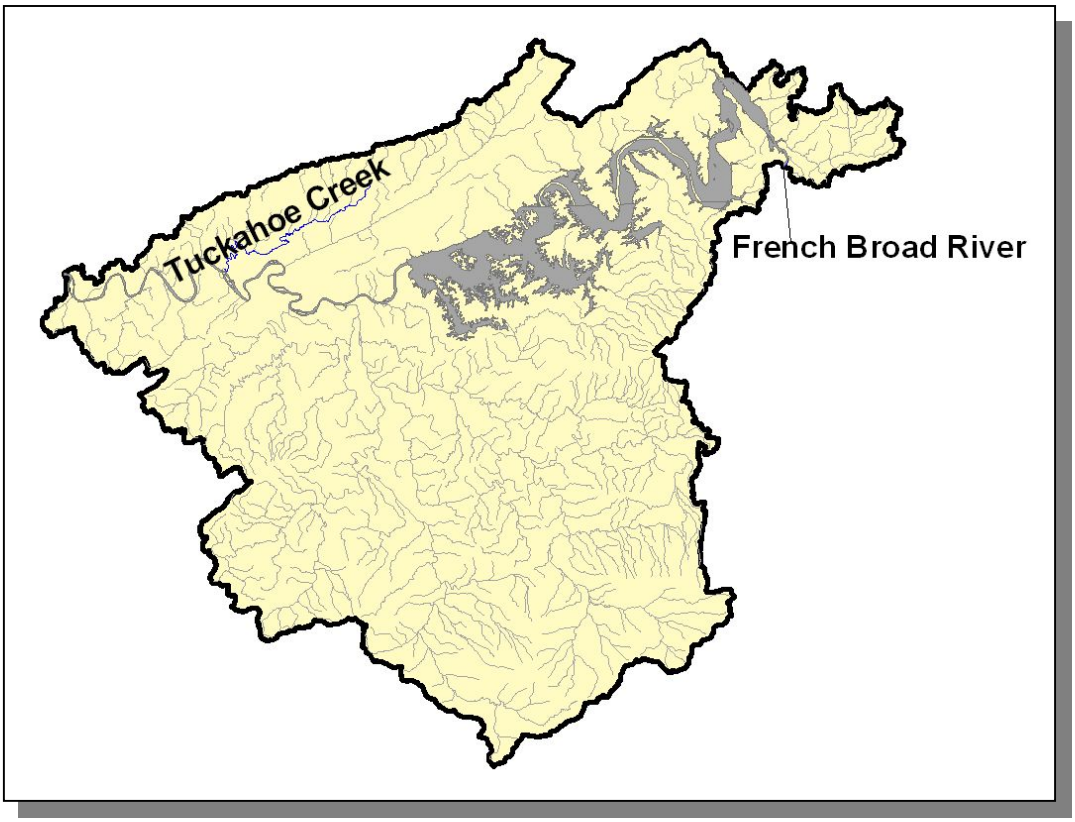

Figure 2-14. Tuckahoe Creek and Portions of French Broad River are Designated State Scenic Rivers*. More information can be found at http://www.state.tn.us/environment/na/scenicrivers/.*

2.7.B. Nationwide Rivers Inventory. The Nationwide Rivers Inventory, required under the Federal Wild and Scenic Rivers Act of 1968, is a listing of free-flowing rivers that are believed to possess one or more outstanding natural or cultural values. Exceptional scenery, fishing or boating, unusual geologic formations, rare plant and animal life, cultural or historic artifacts that are judged to be of more than local or regional significance are the values that qualify a river segment for listing. The Tennessee Department of Environment and Conservation and the Rivers and Trails Conservation Assistance branch of the National Park Service jointly compile the Nationwide Rivers Inventory from time to time (most recently in 1997). Under a 1980 directive from the President's Council on Environmental Quality, all Federal agencies must seek to avoid or mitigate actions that would have an adverse effect on Nationwide Rivers Inventory segments.

The most recent version of the Nationwide Rivers Inventory lists portions of three rivers in the Lower French Broad Watershed:

> French Broad River (RM 0 to North Carolina State Line) is a mountainous stream with good whitewater and scenic gorge areas, numerous rock gardens, boulder beds, rapids, islands, and ledges. It has a diversity of flora and fauna and significant archaeological sites border the river.
>
> Little Pigeon River – Middle Prong (RM 10 to RM 34) is a scenic, sparkling, excellent whitewater stream with waterfalls and is noted as a trout habitat.
>
> Little Pigeon River, West Prong (RM 19 to RM 29) is a scenic, clear mountain stream with considerable recreational potential.

RIVER	SCENIC	RECREATION	GEOLOGIC	FISH	WILDLIFE	HISTORIC	CULTURAL
French Broad	X	X	X	X	X	X	X
Little Pigeon River, Middle Prong	X	X	X	X	X	X	X
Little Pigeon River, West Prong	X	X	X				

Table 2-5. Attributes of Streams Listed in the Nationwide Rivers Inventory.

Additional information may be found online at http://www.ncrc.nps.gov/rtca/nri/

2.7.C. Public Lands. Some sites representative of the cultural heritage are under state or federal protection:

- Cove Mountain WMA is managed by the Tennessee Wildlife Resources Agency (TWRA). More information may be found at: http://www.state.tn.us/twra/hunt001b2b.html

- Douglas Dam Camping Area is managed by the Tennessee Valley Authority (TVA). More information may be found at: http://www.tva.gov/river/recreation/camping.htm

- Forks of the River WMA is managed by the Tennessee Wildlife Resources Agency (TWRA). More information may be found at: http://tennessee.gov/twra/gis/wmapdf/Forks%20of%20the%20River.pdf

- Ford Swamp is administered by the TWRA.

- The Great Smoky Mountains National Park consists of 521,621 acres of land managed by the National Park Service. More information may be found at: http://www.nps.gov/grsm/

- Henderson Island Refuge is managed by the Tennessee Wildlife Resources Agency (TWRA) and Ducks Unlimited, Inc. More information may be found at: http://tennessee.gov/twra/gis/region4maps.html and at http://www.ducks.org/Tennessee/TennesseeProjects/1500/HendersonIslandWMAWetlandsEnhancement.html

- Rankin Bottom WMA is managed by TWRA. More information may be found at: http://www.state.tn.us/twra/gis/wmapdf/Rankin.pdf

- Walters Bridge Access is administered by the TWRA.

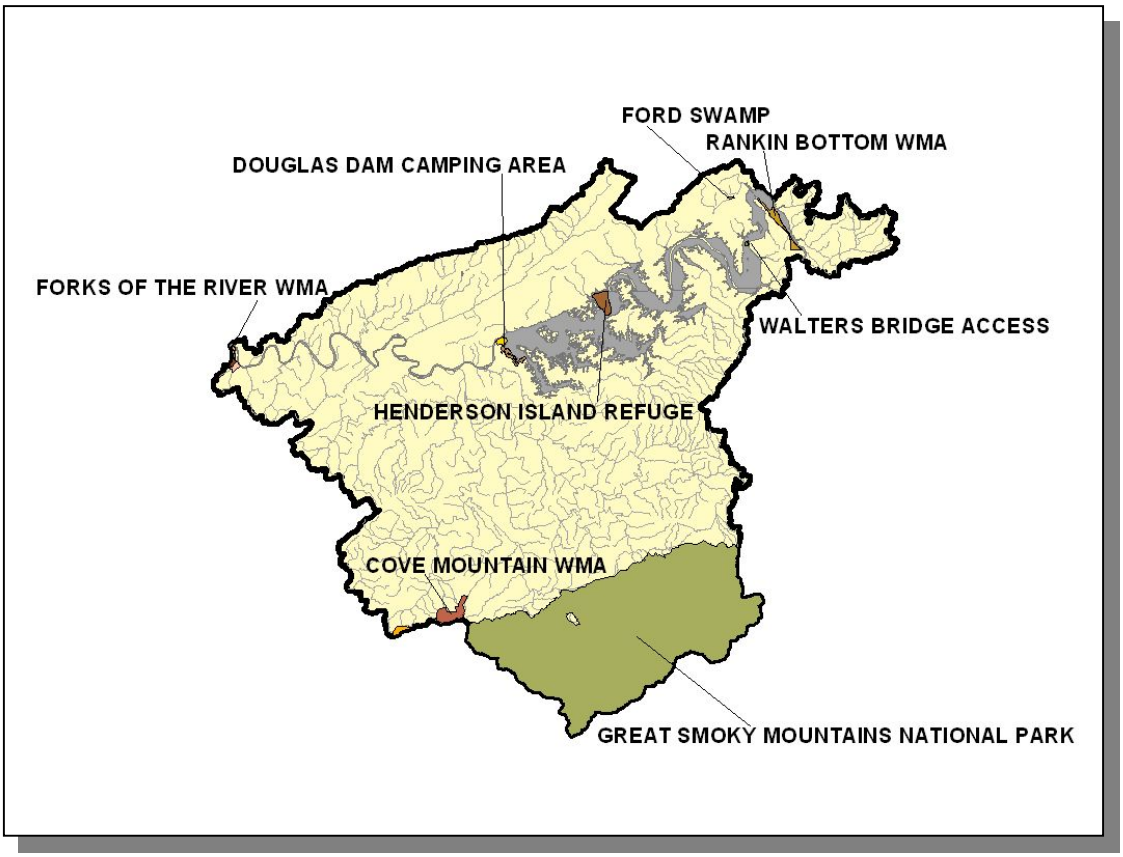

Figure 2-15. Public Lands in the Lower French Broad River Watershed. *Data are from Tennessee Wildlife Resources Agency. WMA, Wildlife Management Area.*

2.8. TENNESSEE RIVERS ASSESSMENT PROJECT. The Tennessee Rivers Assessment is part of a national program operating under the guidance of the National Park Service's Rivers and Trails Conservation Assistance Program. The Assessment is an inventory of river resources, and should not be confused with "Assessment" as defined by the Environmental Protection Agency. A more complete description can be found in the Tennessee Rivers Assessment Summary Report, which is available from the Department of Environment and Conservation and on the web at:

http://www.state.tn.us/environment/wpc/publications/riv/

STREAM	NSQ	RB	RF	STREAM	NSQ	RB	RF
Ball Creek	4			Koontz Creek	4		
Bird Creek	3			Leconte Creek	1		
Boyds Creek	3			Little Pigeon River	1,4	1,2,3	1
Clear Creek	4			Middle Creek	4		
Cove Creek	3		2	Muddy Creek	4		
Dudley Creek	2		1	Porter Creek	1		
Dumplin Creek	3		3	Rimmer Creek	4		
Dunn Creek	2			Roaring Fork Creek	2		
East Fork Pigeon River	3			Seahorn Creek	4		
French Broad River	2,3	2,3		Spring Creek	4		
Gists Creek	3			Tuckahoe Creek	3		2
Goose Creek	4			Walden Creek	3,4		
Happy Creek	3			Webb Creek	2		
Hettie Creek				West Prong Little Pigeon River	1,3	2	
Knob Creek	3			Wilhite Creek	2		

Table 2-6. Tennessee Rivers Assessment Project Stream Scoring in the Lower French Broad River Watershed.

Categories: NSQ, Natural and Scenic Qualities
RB, Recreational Boating
RF, Recreational Fishing

Scores: 1. Statewide or greater Significance; Excellent Fishery
2. Regional Significance; Good Fishery
3. Local Significance; Fair Fishery
4. Not a significant Resource; Not Assessed